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FURTHER EVIDENCE OF THE RELATION OF THE EUPHORIC ATTITUDE TO SLEEP AND EXERCISE*

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While the influence of attitude in a psychological experiment receives varying degrees of consideration depending on the purpose of the experimenter, the fact of the existence of determining tendencies is no longer a moot question. As Cantril (6) has clearly shown, general attitudes exercise a determinative influence upon relatively specific attitudes and reactions. This fact is of especial significance in the field of affectivity where experimental results are characteristically variable in spite of the rigid attention many workers have given to technique and controls. Ordinarily a resolution to this problem is sought in the collection of large masses of data thereby establishing statistical reliability by force of numbers. Such a procedure serves very well for discovering general trends, but when this happens it is very easy to neglect atypical data. In dealing with an unusual response we are often helped by other data which give evidence of basic attitudes. The writer and Barry (5) have supported the view that euphoria, a term aptly designating feeling tone or the state of general well being, is properly regarded as a basic attitude. This conclusion followed the discovery of a positive relationship between self-ratings of euphoria and the ratios of pleasant to unpleasant productions obtained when equal times were allowed for listings in the two categories. Thus, the averages showed that subjects reporting high euphoria tended to make a relatively large number of pleasant productions and a relatively small number of unpleasant ones.

Other investigators have presented evidence consistent with this conclusion. Johnson (14, 15) examined both the behavioral and the subjective correlates of mood. Her results indicated statistically significant differences between data collected when subjects were in euphoric and in depressed moods. The euphoric state was associated with various quantifiable behavior correlates such as a greater number of spontaneous remarks, fewer regressions in thought, greater speed of decision, expansive trends in writing area, and fewer fluctuations of ambiguous figures. On the other hand, subjective ratings by her subjects when

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they were euphoric showed greater social confidence, increased physical energy, more expansive social attitudes toward others, greater decisiveness, and greater desire to be talkative. Hersey's (13) study of industrial workers' emotions included data on the correlates of mood. The "happy, elated" state was marked by various tendencies including greater drive to activity, less feelings of conscious effort, less sensitivity to fatigue, and participation in extra plant activities. More recently Barrett (1) has demonstrated the importance of mental set in determining the relative number of pleasant and unpleasant items recalled after a delay. Her findings suggested that emotional attitude was a more potent agent than logical relevance. In agreement with the majority of earlier experimenters,[1] Barrett found that pleasant words were better remembered than unpleasant when no attempt was made to create a special attitude. This, she notes, is consistent with the evidence that most college students spend more of their time pleasantly than unpleasantly. In different words, the generally prevailing euphoria determines the greater memory value of the affectively consistent cerebral processes.

Other investigators, recognizing the influence of affective attitude on memory, have used the terms *optimist* and *pessimist* in classifying their subjects according to the relative number of pleasant and unpleasant items they were able to recall. Kowalewski (16) spoke of memory-optimists, memory-pessimists, and memory-indifferentists. Laird (17) presented evidence to show that recall is related to temperament which he diagnosed as optimistic, mixed, and pessimistic. Meltzer (19) labelled his subjects optimists, pessimists, and indifferentists. Cason (7) distinguished between optimistic and pessimistic temperaments. While optimism and pessimism are unquestionably attitudinal traits, these terms have rather specific implications in regard to the so-called higher mental processes. By substituting high euphoria and low euphoria, we have the advantage of more basic concepts that do not imply a peculiar type of social conditioning.

The foregoing evidence indicates progress in the isolation of descriptive correlates of euphoria, and that the discovered facts allow a more adequate definition. Thus, granting the reliability of available data, we can define euphoria as an attitude capable of determining the ratio of pleasant to unpleasant productions, the memory value of pleasant experiences as compared with unpleasant, the number of spon-

[1] For excellent reviews of the literature see Meltzer (18), Beebe-Center (3), Cason (7), Moore (20), and Barrett (1).

taneous vocalizations, speed of decision, reports of social confidence, etc. It is evident that this attitude has sufficient determining power to warrant an interest in its systematic significance. If variations in euphoria can account for peculiarities in a subject's recordable behavior, there is reason for assigning a place to euphoria in sequences of psychologically important events.

A second category of correlates of euphoria comprises the antecedent agents or causes. Most observations in this connection are rather casual comments in the medical literature on the effects of drugs and pathological conditions. The psychologists, however, have not neglected this matter. Johnson (15) believes that mood is largely determined by neuromuscular tonus, which in the final analysis depends on internal biochemical changes of a somewhat rhythmic nature. Experimental evidence has demonstrated the potency of verbal stimuli to alter euphoria. Fisher and Marrow (10) showed this in their study of hypnotically induced moods. They found that suggested despondent moods lowered the threshold for despondent thoughts, while suggested elated moods facilitated elated thoughts. Especially interesting was their observation of a marked increase in association reaction times during depression. These findings attested the genuineness of the suggested euphorias. Barry and the writer (2) observed that worried subjects reported a lower average euphoria than those who were unworried, thus giving a simple demonstration of the potency of experience to alter this attitude. In this study we were mainly concerned with data showing a marked relationship between present euphoria and the sleep reported for the previous night. The average euphoria of those having eight or more hours of sleep was significantly greater than the average euphoria of those having six hours or less. We also noted that euphoria appeared to be related to amount of exercise. Dysinger (8, 9) found that the correlations between estimates of mood and physical condition were generally low and positive. His data showed that while a depressed mood usually accompanied a poor physical condition, there were too many cases of good physical condition accompanying a depressed mood to allow the assumption of a close relationship. It thus appeared that physical condition should be regarded as a contributing factor in the determination of mood. Only in actual illness was it a certain cause. In most of the reports the subjects claimed they were unable to assign adequate causes for their various moods. The analysis of the returns indicated, however, that factors of daily experience were most often mentioned as being responsible

for the existing mood.

The present study was undertaken with the purpose of obtaining more information concerning sleep and exercise as agents in the genesis of euphoria. The subjects were 349 undergraduate students in psychology, 222 men and 127 women. During their regular class periods these subjects gave ratings of their present euphoria, and answered a series of questions relating to their sleep and exercise. Euphoria was defined as "how well you feel; plus five being as well as possible and minus five being as badly as possible." The questionnaire included the following items:

1. Present euphoria on a plus five to minus five basis.
2. Usual time of retiring in the evening estimated to the nearest quarter hour.
3. Usual time of rising in the morning estimated to the nearest quarter hour.
4. Number of times during the past week you have deviated by a half hour or more from your usual schedule of retiring and rising.
5. Time of retiring last night estimated to the nearest quarter hour.
6. Time of rising this morning estimated to the nearest quarter hour.
7. Amount of what you consider exercise during the past 24 hours estimated to the nearest quarter hour.

Some of the subjects were unable to answer all the questions. In these cases such information as the subjects gave was used. With the omissions, the separate series of calculations were based on 337 to 348 returns. It may be seen that the average euphorias presented in the various tables are consistently positive. Actually only 18% of all the individual ratings were negative. This hedonic emphasis adds significance to the apparently small differences between the averages since the subjects tended to rate themselves on a much smaller scale than was allowed. A further fact of significance is that the trends indicated by the figures emerge in spite of the variables acting to dilute the effect of any single factor.

Table I shows the relation of present euphoria to the number of times the usual schedule of retiring and rising was broken during the past week. The implications are that adherence to a regularly timed schedule of sleep is conducive to euphoria.

Sleep is a routine habit, and the subjects appeared to have little difficulty in reporting what they considered to be their usual schedules. Because of this periodicity we are justified

TABLE I

EUPHORIA AND DEVIATIONS FROM THE USUAL SCHEDULE OF RETIRING AND RISING DURING THE PRECEDING WEEK

No. of Deviations	Av. Euphoria	P. E. (av.)	Cases
0-1	2.64	0.22	22
2-3	2.11	0.12	127
4-5	1.31	0.15	143
6-up	1.12	0.28	49

in regarding sleep as one of the rhythmic functions. The generality of periodicity was demonstrated by Richter (21) who observed that when animals were left to themselves, their habits of activity became decidedly rhythmic. The writer and Elliott (4), having established a definite rhythm of eating in rats, recorded the effect of delaying the usual period of feeding. Not only did the animals eat less when food was finally made available, but the disturbance persisted long after the original schedule was restored. It appears that we are dealing here with the general principle that the maintenance of periodicity in routine habits is conducive to the welfare of the organism.

TABLE II

EUPHORIA AND DEVIATIONS FROM THE USUAL RETIRING AND RISING TIMES*

Deviations from Usual Retiring Time	Av. Euphoria	P. E. (av.)	Cases
—60 and earlier	1.97	0.27	34
—15 to —45	2.09	0.21	55
0	2.00	0.22	33
+15 to +45	1.69	0.15	104
+60 to +90	1.56	0.22	59
+105 and later	1.40	0.24	52
Deviations from Usual Rising Time			
—60 and earlier	0.43	0.32	14
—15 to —45	2.00	0.20	59
0	1.75	0.14	155
+15 to +45	1.68	0.15	105
+60 and later	0.91	0.38	11

* Deviations are given in minutes, and refer to the night before and day of the experiment. Minus signs indicate earlier than usual and plus signs later than usual.

Table II presents further evidence of the relation of euphoria to deviations from an established habit. These data imply that the optimum times for retiring and rising range between being on schedule and 15 to 45 minutes early. It is possible that the results are distorted by a tendency to overestimate the times reported for the usual schedules. Even allowing for the influence of such extraneous factors, however, it appears that marked deviations from an established schedule are associated with reduced euphoria.

The relationship between euphoria and the actual times of retiring and rising appears in Table III. These figures favor the early retirers. An interesting contrast appears when we compare the results of this table relating to the groups rising from 7:00 to 7:25 and 8:00 or later with further data. The former had an average deviation from their usual schedules of rising of 10.8 minutes, while the late risers had an average deviation of 25.6 minutes. There was very little difference between the two groups in respect to their deviations the previous evening, the averages being 56.8 and 59.4 minutes respectively.

Since, as was shown by Barry and the writer (2), a reduction in the quantity of sleep is associated with lower euphoria, the question arises of the relationship between the quantity of sleep and variation in the hours of retiring and rising. Table IV shows the two factors cannot be considered independently. Subjects reporting 8 to 8¾ hours of sleep the previous night have the smallest average number of departures from their usual schedules during the past week. On the other hand, amounts of sleep below and above this range involve a more variable program.

TABLE III

EUPHORIA AND ACTUAL TIMES OF RETIRING AND RISING*

Time of Retiring	Av. Euphoria	P. E. (av.)	Cases
10:30 or earlier	2.18	0.20	61
10:45 to 11:30	1.67	0.16	97
11:45 to 12:30	1.73	0.16	102
12:45 or later	1.17	0.20	81
Time of Rising			
6:55 or earlier	1.50	0.23	54
7:00 to 7:25	2.18	0.16	103
7:30 to 7:55	1.54	0.15	132
8:00 or later	1.44	0.21	57

* Times refer to the night before and the day of the experiment.

TABLE IV

SLEEP LAST NIGHT AND THE NUMBER OF TIMES THE SCHEDULE OF RETIRING AND RISING WAS BROKEN DURING THE PAST WEEK

Hours of Sleep Last Night	Av. Breaks in Schedule	P. E. (av.)	Cases
9 or more	3.77	0.15	43
8 to 8¾	3.47	0.11	91
7 to 7¾	3.80	0.11	120
6 to 6¾	3.92	0.15	51
5¾ or less	4.37	0.21	43

An inspection of the various tables of data shows that deviations from the usual schedules of retiring are predominantly in the direction of late hours. Furthermore, these deviations, taken as a whole, are not balanced by extra sleep in the morning. In order to obtain at least a partial check on the operation of the rhythm factor, all subjects reporting 8 or more hours of sleep the previous night were separated into two groups: (1) those who kept within 25 minutes of the usual schedules for both retiring the night before and rising on the day of the experiment; (2) those who deviated by 30 minutes or more from the usual schedule during the same period. The "on-schedule" group of 48 subjects had an average euphoria of 2.08±0.22, while the "off-schedule" group of 80 subjects had an average of 1.74±0.16. Those reporting 6¾ hours or less sleep were similarly divided. The statistically insufficient "on-schedule" group comprised only 3 cases with euphorias of 2, 2, and 3. On the other hand the 87 "off-schedule" subjects had an average euphoria of 1.43±0.20. A further partial check was obtained by dividing the subjects reporting 8 or more hours of sleep the previous night into another two groups: (1) those with 0 to 2 deviations in their schedules during the past week; (2) those with 5 or more deviations. The former group of 40 "regular" subjects had an average euphoria of 2.50±0.18. The latter

TABLE V

EUPHORIA AND AMOUNT OF EXERCISE DURING THE PAST 24 HOURS

Hours of Exercise	Av. Euphoria	P. E. (av.)	Cases
0	1.08	0.26	53
.25 to 1.00	1.63	0.15	84
1.25 to 2.00	1.76	0.17	105
2.25 to 3.00	1.98	0.19	57
3.25 or more	1.98	0.26	41

"irregular" group of 36 subjects had an average euphoria of 0.97±0.28. The data of all subjects with 6¾ hours or less sleep the previous night received the same treatment. While the 17 "regulars" had an average euphoria of 1.82±0.29, the 37 "irregulars" had an average euphoria of 0.89±0.35. The foregoing data are consistent with the conclusion that both the quantity and the rhythmic factors of sleep are potential determiners of euphoria. However, the figures do not allow an adequate evaluation of their relative importance.

Table V gives the data on the relationship between present euphoria and exercise during the past 24 hours. The figures suggest that exercise is advantageous, though larger amounts are not associated with a corresponding increase in the returns.

The implications of the various results showing the relationship of the euphoric attitude to sleep and exercise derive considerable theoretical significance from their relevance to neuromuscular adjustments. One of Freeman's (11) experiments provides a link in the discussion. He used a method of obtaining an index of muscular tension. More specifically, he estimated quadriceps tonus by means of a device that amplified changes in tendon deformation. Freeman was interested in tonus because of his evidence that this response acts as an autogenic compensatory mechanism in fatigue and when extra effort is needed. Thus the performance of difficult tasks is accompanied by increased quadriceps tension. His experiment, in this case, consisted of investigating the relationship between the loss of sleep and quadriceps tonus during various performance tests. The data showed that reduction of sleep as well as excessive hours in bed involved an increase in mean quadriceps tonus. The loss of sleep did not, however, reduce the level of performance except when the loss was cumulative. General tension enabled the subjects to maintain their customary level of performance as long as fatigue was not excessive. We may reasonably suppose that the effects of deficient sleep and off-schedule sleep have a high degree of equivalence.

While the evidence is consistent with a tension theory of low euphoria, it is necessary to bear in mind the fact that tension sometimes accompanies pleasantness. Note, however, that action associated with deficient sleep requires greater effort, and is, in a sense, impeded. Theories of processes in the central nervous system often transcend experimental evidence. Nevertheless, observation of behavior appears to lend a measure of justification to Herrick's (12) requisite for pleasantness. He believes that the necessary condition is the normal action of definitely channeled

nerve pathways resulting in uninhibited activity. The significant feature of this principle is that the action must be free. Fatigue or competing patterns of behavior would abolish this freedom.

Exercise is not only motor activity, but it is a form of activity that can be indulged in with a minimum of competition from incompatible action patterns. It is generally conducive to health, and is likely to expose the organism to many stimuli which have become conditioned to elicit the euphoric attitude.

We have already observed that Johnson (14, 15) believes mood to be largely determined by neuromuscular tonus, which in turn is regulated by somewhat rhythmic internal biochemical changes. She supports the view that normal manifestations of mood and pathological extremes are similar in kind. There is nothing in the present study to contradict such a view. It should be noted, however, that Johnson instructed her subjects to report for experimentation when they were experiencing extremes of mood. It is possible that such instructions favored constitutionally determined variations. This may be the reason why her data on the relation of sleep to mood are at variance with the results of the present experiment. Actually her depressed subjects reported slightly more sleep than her euphoric subjects. Inasmuch as Hersey's (13) industrial workers had definitely cyclic variations in euphoria, a similar explanation may account for his observation that elated subjects required less sleep than the depressed. Johnson's (14, 15) data on university women, however, were insufficient to establish euphoria rhythms as a rule, and Dysinger's (8, 9) university men and women gave no evidence of such periodicity.

The obvious inference from available evidence is that there are many determiners of the euphoric attitude. At any time the action of one may obscure the effects of others as shown by the high variability of the data. The present study shows that the schedule of sleep and amount of exercise, both of which are subject to a high degree of control, must be included in the list of agents. Since the euphoric attitude has a large amount of determining power, it should receive attention because of its practical importance, its influence in the psychological experiment, and its significance for psychological theory.

SUMMARY

A survey of the literature showed that progress has been made in the isolation of two classes of correlates of the euphoric attitude: (1) *descriptive facts*, making possible a

more adequate definition of the concept; (2) *antecedent agents,* acting as determiners of euphoria. An experiment was undertaken to obtain more information concerning sleep and exercise as determining agents. A group of undergraduates answered a questionnaire relating to their present euphoria and their schedules of sleep and exercise. Averages calculated from various combinations of items in 337 to 348 returns suggested the following conclusions:

1. Euphoria varied inversely with the number of deviations during the preceding week from what the subjects reported as their usual schedules of retiring and rising.
2. Euphoria was highest for those subjects whose retiring times the night before and rising times on the day of the experiment ranged between being on their usual schedules and 15 to 45 minutes early.
3. The optimum time for retiring was 10:30 p. m. or earlier, and for rising, 7:00 to 7:25 a. m.
4. Subjects reporting 8 to 8¾ hours of sleep the previous night had the fewest deviations during the previous week from their usual schedules of retiring and rising.
5. When the amount of sleep was kept constant, the subjects who had kept closely to their usual schedules of sleep reported a higher euphoria than those who deviated widely.
6. Exercise was advantageous for euphoria, though amounts in excess of 3 hours were associated with no increase in the returns.

These facts are in harmony with the view that the euphoric attitude is a neuromuscular adjustment. The determiners of this adjustment include the regularity of adherence to temporally conditioned routine habits.

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